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SOVIET SCIENTIFIC CONFERENCES

ON POWER MACHINE BUILDING

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FOREWORD

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SOVIET SCIENTIFIC CONFERENCES
ON POWER MACHINE BUILDING

[This report contains the translations of two articles on scientific conferences held in the Soviet Union published in Prikladna Mekhanika (Applied Mechanics). Complete bibliographic information accompanies each article.]

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SCIENTIFIC CONFERENCE ON HIGH TEMPERATURE DURABILITY

[Following is the translation of an article by V. P. Dubinin in Prikladna Mekhanika (Applied Mechanics), Vol. No. 2, Kiev, 1961, pages 228-229.]

Over a hundred and fifty workers of academic and industrial branch scientific research institutes, of industry and higher educational institutions of Moscow, Leningrad, Kiev, and other cities of the Soviet Union took part in the conference on high temperature durability in power machine building, which convened in Kiev on the initiative of the Institute of Ceramic Metallurgy and Special Alloys, AN [Akademiya Nauk -- Academy of Sciences] UkSSR, and the State Committee for Science and Engineering of the Council of Ministers UkSSR.

The conference took place between 21 and 23 June 1960. It began with a word of introduction by I. M. Frantsevich, director of IMSS [Institut Metalokeramiki i Spetsial'nykh Splav -- Institute of Ceramic Metallurgy and Special Alloys] AN UkSSR, and corresponding member of the AN UkSSR.

The following reports were heard at the conference: G. S. Pisarenko (IMSS, AN UkSSR) -- Studies on High Temperature Durability at the Institute of Ceramic Metallurgy and Special Alloys, AN UkSSR; V. M. Rudenko (IMSS, AN UkSSR) -- Studies on Static Durability of Heat-resistant Materials which are Obtained by Methods used in Ceramic Metallurgy; V. G. Timoshenko and V. I. Kovpak (IMSS, AN UkSSR) -- Device for Testing the Enduring Strength of Heat-resistant Materials on Scheduled Change of Load and Temperature; O. F. Tereshchenko of KPI [Kievskiy Politechnicheskii Institut -- Kiev Polytechnical Institute] -- Study on the Influence of the Conditions of Heating upon the Durability Characteristics of Heat-resistant Materials; V. V. Bolotin (Institute of Mechanics of the Academy of Sciences USSR) -- Scalar Effect and Scatter of Characteristics of Strength of Friable Materials for Various Kinds of Load; V. Ya. Kelekhsayev (Moscow) -- Use of Metallic Powders in Manufacturing Bimetallic Sheets and for Increasing the Structural Strength of Steel; I. A. Oding and L. K. Gordiyenko (Institute of Metallurgy imeni Baykov, Academy of Sciences USSR) -- Study on Structural Changes in Metals and Alloys During High Temperature Creep by Measuring Changes in Their Electric Conductivity; M. M. Sklyarov (Moscow) -- Testing Heat-resistant Alloys in Regard to Creep of Short (matter of seconds) Duration; V. P. Dubinin (IMSS, AN UkSSR) -- Study on the Influence of Structural Factors upon the Enduring Strength of Certain Heat-resistant Turboblade Materials; I. A. Kozlov and I. V. Lebedyev (IMSS, AN UkSSR) -- Some

Questions Concerning Experimental Study of the Carrying Capacity of Disks with Regard to Temperature; V. G. Timoshenko (IMSS, AN UkSSR) -- A String Pickup for Measuring Deformations at High Temperatures; V. T. Troshchenko (IMSS, AN UkSSR) -- Durability of Metallo-ceramic Heat-resistant Materials under Non-stationary Conditions of Cyclic Loads and Temperature; M. I. Chayevskiy (Institute of Machine Technology and Automation, AN UkSSR) -- Strength of Steel when in Contact with Fused Eutectics Pb -- Sn and Pb -- Bi; V. O. Kuz'menko (IMSS, AN UkSSR) Study on Elastic, Stable Heat-resistant Materials at High Temperatures; V. T. Troshchenko, B. O. Gryaznov (IMSS, AN UkSSR), L. A. Kaplinskiy (Plant of Automatic Machines imeni Gor'kiy) -- Influence of Static Stretching upon the Endurance of 1x13 Steel; M. I. Chernyak (Institute of Mechanics, AN UkSSR) -- Influence of a Previous Deformation upon the Endurance of Heat-resistant Alloys; B. O. Gryaznov (IMSS, AN UkSSR) -- Study on the Endurance of Heat-resistant Materials in a Complex Tense State under High Temperature Conditions; V. T. Troshchenko (IMSS, AN UkSSR) -- on the Durability of Turbine Blade Shafts in a Complex State of Tension under Conditions of High Temperatures; I. O. Troyan (IMSS, AN UkSSR) -- Study on the Influence of Load Frequency upon Durability of Heat-resistant Alloys at High Temperature Conditions; I. G. Fridlender and D. M. Petergerya (Zaporozh'ye Machine Building Institute) -- Study on the Influence of Electrochemical Polishing on Strength and Durability at High Temperature of the Alloy (ЭИ 437Б) (EI 437B); M. V. Novikov (IMSS, AN UkSSR) -- Study on Damping Properties of Heat-resistant Materials at High Temperatures; M. Ya. Leonov and Ya. S. Pidstrigach (Institute of Machine Technology and Automation, AN UkSSR) -- On Differential Equations of Thermodiffusion in a Solid State; M. M. Sklyarov (Moscow) -- On a Rational Method of Testing Heat-resistant Alloys for Refractiveness; Ye. M. German (Moscow) -- Influence of Heat Changes on the Durability of Metallo-ceramic Alloys; M. S. Mozharovskiy (KPI) -- Study on Thermal Fatigue of Heat-resistant Materials; I. M. Fedorchenko and N. O. Filatova (IMSS, AN UkSSR) -- Studies on Mechanical Properties of Metallo-ceramic Iron at Higher Temperatures; G. M. Tretyachenko and L. V. Kravchuk (IMSS, AN UkSSR) -- Methods of Testing Friable Materials for Heat Shock; G. M. Tretyachenko and L. V. Kravchuk -- Study on the Tense State and Destruction of Metal-ceramic Parts at Abrupt Temperature Changes; V. K. Kuz'menko (KPI) -- Study on the Durability Characteristics of Certain High-melting Materials at Temperatures Close to 2,000°C; O. F. Pronkin (Moscow) -- Methods of Designing Construction Lines and Calculating the Strength of Non-uniformly Heated Disks with Regard to Plasticity and Creep, according to the principle of threshold stresses.

The conference noted considerable progress in the field of development of theoretical and experimental work connected with the problem under consideration.

The intense development of those studies in recent time is due to demands brought forward by new branches of industry.

A number of scientific research and design organizations have achieved valuable results in studies directed toward finding new materials able to operate under conditions of high temperatures, as well

as in studies devoted to a comprehensive familiarization with the strength of these materials and of structural elements at high temperatures.

At the same time the conference ascertained that research being carried out on the strength of materials, components, and structures at high temperatures, associated with power machine building, do not entirely satisfy present demands and require substantial development.

This concerns, first of all, the following fields:

1. Development and study on the strength of new materials which would be able to function reliably at temperatures up to 2,000°C-3,000°C and higher.

2. Research on the strength of power machine parts under conditions of non-stationary load and higher temperature.

3. Development of reliable experimental methods for studying the strength of materials and of actual structures at temperatures up to 2,000°C and higher. This concerns, in the first place, the development of reliable methods of measuring high temperatures and creation of experimental machines that would make it possible to conduct tests under conditions of non-stationary loads and temperatures.

4. Development of theoretical methods of evaluating the strength of materials and structures in operation, under conditions of high temperatures.

5. Wide adoption of methods of physics in the study of durability at high temperatures.

6. Research on high temperature durability at large and small test bases.

Attaching an extraordinary importance to the further extensive development of the studies on the high temperature durability in power machine building, the conference has recommended to the corresponding scientific research institutions to devote special attention to the development of the above-listed scientific aims in this field.

SCIENTIFIC CONFERENCE ON VIBRATIONS AND THEIR DAMPING IN POWER MACHINES

[Following is the translation of an article by A. P. Yakovlyev in Prikladna Mekhanika (Applied Mechanics), Vol. VII. No. 2, Kiev, 1961, pages 229-230.]

On 11-13 October 1960 a conference took place in Kiev on problems associated with vibrations and their damping in power machines, which has been called by The Institute of Ceramic Metallurgy and Special Alloys, AN UkSSR jointly with the State Committee for Science and Engineering of the Council of Ministers UkSSR. This has been the third All-Union conference devoted to the above-mentioned scientific field. The previous two conferences have also taken place in Kiev; the first one in June 1956 and the second one in December 1958.

The conference was attended by more than one hundred and twenty workers of academic and industrial scientific research institutes, industry, and higher educational institutions of Kiev, Moscow, Leningrad, and other cities of the Soviet Union.

The director of the Institute of Ceramic Metallurgy and Special Alloys (IMSS, AN UkSSR), and corresponding member of the AN UkSSR, I. M. Frantsevich, opened the conference by a short word of introduction.

The following reports were heard at the conference: G. S. Pisarenko (IMSS, AN UkSSR) -- On certain Questions Concerning the Study of Vibrations with Regard to Dissipation of Energy; M. V. Vasilenko (IMSS, AN UkSSR) -- Some Problems on Bending Torsional Vibrations in Bars with Regard to Weak Damping; V. G. Ebanoydze (Tbilisi) -- Method of Calculating the Internal Resistance to Vibrations in Elastic Systems; V. G. Timoshenko (IMSS, AN UkSSR) -- Mechanical Vibrations of a System during Hysteresis Losses; P. M. Senik (Lvov) -- On the Function on which Characterizes Energy Dissipation in Elastic Systems; Yu. O. Klikh (Odessa) -- Study on Vibrations in Elastic Systems with a Two Degree Play, with regard to energy dissipation; P. M. Ruban (Institute of Foundry Manufacture, AN UkSSR) -- Determination of Energy Dissipation in Material by Measuring Hysteresis Loops; K. T. Shatalov of IMASH [Institut mashynobuduvannya -- Machine Building Institute,] AN UkSSR -- On the Determination of Hysteresis Loops by means of Spring Dynamometers; V. V. Khil'chevskiy of KPI (Kievskiy politekhnicheskii institut -- Kiev Polytechnic Institute) -- Influence of the State of Tension upon the Energy Dissipation in Rods During Vibrations; V. V. Khil'chevskiy -- On the Damping Properties of Certain Plastics; A. P. Yakovlyev (IMSS, AN UkSSR) -- Experimental Study on Energy Dissipation During Transverse Vibrations in Rods; A. P. Yakovlyev -- Apparatus for Studying Damping Properties of Materials at Low Temperatures; M. V. Novikov (IMSS, AN UkSSR) -- Energy Dissipation in the Substance of Rods During Vibrations of Various Kinds; M. V. Novikov -- Studies on the Influence of High Temperatures on Damping in Heat-resistant Materials; M. O. Kryshchal and S. O. Colovin (Tula) -- Damping Properties and Durability of Heat Treated Carbon Steel; T. M. Samarina (Moscow) -- Theory and Experimental Adjustment of Design of a

Multiform High-frequency Installation for Testing the durability of materials at high temperatures; I. Ye. Debrivniy (KPI) -- On the Determination of Damping Properties of Steel Cables; Ya. G. Panovko (Riga) -- On the Tenth International Congress on Applied Mechanics; M. M. Mukhin (KPI) -- Influence of the Dimensions of Structural Elements on the Energy Dissipation in Material During Torsional Vibrations; Ya. A. Bratus' (KPI) -- Damping of Vibrations in Rod Bundles with regard to Structural Factors; K. O. Prokofyev TsNKI [Tsentral'niy naukovo-doslidniy institut -- Central Scientific Research Institute] imeni O. M. Krilov, Leningrad -- On the Method of Determination of the Decrement of Vibrations in Turbomachine Blades; B. O. Gryaznov (IMSS, AN UkrSSR -- Study on the Breakdown of Turbine Blades at Higher Forms of Vibrations; I. Ya. Mahin (Sverdlovsk) -- Studies on Damping Properties of Blade Steel with High Chrome Content; S. L. Zhukov (Moscow) -- Damping in Materials at High Stresses, as Determined from Hysteresis Loops; Ye. S. Sorokin (Moscow) -- A Review of the Recent Studies on the Dissipation of the Energy of Vibrations in Materials and Structures, Carried out at the Academy of Construction and Architecture of the Soviet Union; F. F. Bolotin and I. O. Lurye (Leningrad) -- Damping Supports in Diesel Installations Against Torsional Resonance Vibrations; O. S. Shemonayev TsKTI [Tsentral'niy kotloturbinniy institut -- Central Boiler and Turbine Institute] imeni Polzunov in Leningrad -- Studies on the Excitation of Vibrations in Turbomachine Blades; R. V. Zelyukova (Odessa) -- On the Damping of Vibrations in Compound Rods with Negative Allowance and Metallized Coating.

The conference has demonstrated that theoretical development, which has led to creation of a number of methods for calculating the vibrations taking place in the components of turbomachines and in other machine parts, as well as the experimentally-obtained data on the damping properties of a great variety of cast materials, metal-ceramics and plastics, is very useful in practical work on the part of designers and scientific workers of design institutions, industrial organizations, and so on. The most important result in the field of studies on the damping of vibrations in materials and structures and on the allowances to be made for it in calculations have been obtained at the Institute of Ceramic Metallurgy and Special Alloys AN UkrSSR; at the Kiev Polytechnic Institute; at the Odessa Polytechnic Institute; TsNKI imeni O. M. Krilov; TsNKI of Building Structures; Academy of Sciences Latvian SSR; at the Laboratory of Hydraulic Machines AN UkrSSR, and so on.

The conference has decided that the following steps are necessary:

1. To promote the all-round development of theoretical studies concerning methods of calculating vibrations in elastic systems with regard to energy dissipation due to the external as well as the internal causes. Particular attention is to be given to calculations of complex vibrations that occur most frequently under actual conditions; the temperature is to be considered among other factors. The already developed methods are to be recommended for use in calculations connected with designer's work, for the purpose of evaluating their effectiveness, preciseness, reliability, and limitations.

2. To direct attention toward working out and adoption of a

uniform terminology and establishment of expedient criteria for evaluating the damping properties of real structures and materials, allowing for the influence of various factors (type of material and its condition, structural factors, and external surroundings).

3. To emphasize the urgency in regard to experimental studies on the following problems in the field of vibrations and their damping: study on laboratory models, of the damping characteristics of materials in a state of uniform stress, with regard for temperature; determination of damping characteristics under stable conditions, among others by the method of hysteresis loops; study of the influence which the state of stress has upon damping; study on damping of complex vibrations in elements of structures; study of the relationship between damping properties and durability; study of the damping properties of plastics.

In studying the damping properties of materials, especial attention is to be given to learning the physical nature of the phenomena that occur in various materials under the influence of a changing dynamic load. The problem of studying and analyzing damping properties of real structures is also to be considered as deserving special attention.

4. The development of ways and means of damping mechanical vibrations is to be regarded as one of the most important tasks in the field of study of vibrations and means for combatting their harmful influence.

5. To continue the development of standard installations and models in order to determine the damping properties of materials which could be standardized and recommended for a wide adoption in research and manufacturing practice.

6. To publish the proceedings of the conference.

7. The next conference, on energy dissipation during vibrations in elastic systems, is to be held in 1962.